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SUBJECTIVE REFRACTION TECHNIQUE

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For the past several years objective refraction has received paramount attention in the practice of optometry, not only in the use of special instruments but in the practice of specific technique.

Subjective refracting has been relegated to the back ground, perhaps for no other reason than the endeavor to rise from primitive methods practiced before efforts were made to advance the standards of optometric education.

It is well and good that the old method of subjective refracting be placed in the background, but in its place we should apply a new technique which will co-ordinate with objective findings and in this way hope for a more finished procedure then when relying on either test alone.

Many objective refractionists obtain very accurate results and it is not my desire to lessen confidence in objective work but to strengthen ability to complete the analysis which will leave no trace of inaccuracy, if possible.

Our object in practicing optometry is to perfect visual efficiency, is it not therefore essential that we use every effort, in applying technique that will give the patient maximum service and this, I think should include the patient's co-operation as is required in subjective refracting.

Every optometrist knows and uses some form of subjective refraction, some no doubt have specific technique and obtain accurate results. It is not my object to praise or blame, instead I wish to describe a method I have used for several years with INCREASING confidence and hope it may prove to be comprehensive and practical for those who are especially interested in this branch of refraction.

Astigmatic corrections are no doubt the most difficult and I will endeavor to emphasize that part of the technique in regard to obtaining the proper amount and exact axis of the cylinder.

The opthalmometer and retiniscope gives us the measure of corneal astigmatism and the amount of error manifest and often latent.

The subjective refraction gives us the opportunity of using the objective findings and with the co-operation of the patient arrive at a satisfactory and accurate correction from which we will perhaps write our prescription.

Although the objective findings may differ we can always be assured that the present refractive error corrected accurately will open the way to finally relieve the total error.

There are several good subjective tests for astigmatism and often we are compelled to use more than a single test to confirm our results.

The astigmatic charts I use and prefer are illustrated in Figures 1 and 2.

Fig. 1

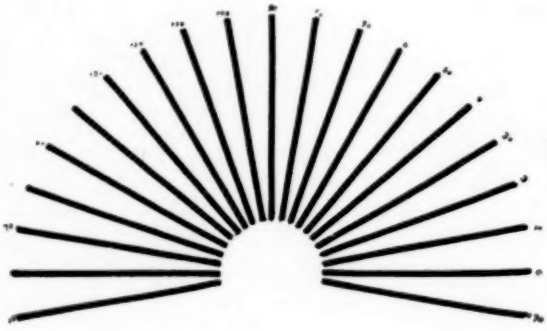
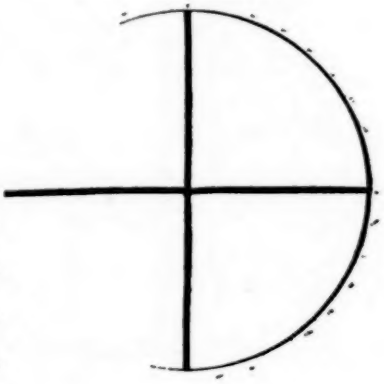


Fig. 2



They are taken from those of Dr. Walter B. Lancaster, Boston, Mass.

Figure 1, the fan dial chart, is made from the whitest stock, heavy cardboard about 22″ square. The radii in the fan are about 8″ long and 10° apart. The lines extend 10° beyond the 180° meridian on each side. There is also a clear center space about 4″ in diameter. The lines are made from narrow, black velvet ribbon measuring about 5 mm. wide and glued carefully on perfectly drawn lines.

I prefer the lines 10° apart which makes it possible for them to be distinguished when quite blurred. It is also an advantage in securing the exact axis of the cylinder in high errors of astigmatism and you may be sure you are within 5° in small errors.

Figure 2 illustrates the wheel chart. This is also made from the

whitest cardboard, the background being about 22″ square with a wheel pivoted onto it about 16″ in diameter.

The two lines are made of narrow black velvet baby ribbon glued carefully on lines at right angles to each other.

The edge of the circle is marked on the background at 5° spaces allowing the wheel to be moved to any degree from 5° to 175°.

After the clearest line or lines have been located on the fan dial chart, the two lines are placed at the corresponding degree of clearest line and at right angles to it. This gives you the strongest and weakest median to equalize which is much easier to accomplish than if several lines are visible which may confuse the patient.

With careful technique the two lines can be equalized within ⅛ of a diopter and should be if we want to feel sure we have corrected the error accurately. In the endeavor to correct astigmatism subjectively, you may encounter difficulties due to ciliary contraction or inattention. Before attempting to use the astigmatic chart the eyes must be fogged enough to be definitely sure, the focal interval is kept in front of the retina. Often the patient will remark that the lines on the astigmatic chart look equally blurred, when you are sure there is astigmatism to be corrected as is shown by the objective findings. In this case, place the two lines of the wheel chart at the axis found by the objective findings. The patient may be able to tell a difference immediately, having only two lines to compare. If not, place a minus cylinder axis parallel to one line, then the other, increasing the power of the cylinder until the patient is able to detect the difference. This should arouse attention or relax the accommodation sufficient to enable you to complete the test and often are able to correct the amount you suspect by the objective findings.

If you are not able to relax the eyes with this simple technique, place a plus sphere and plus cylinder in the trial frame, at the amount calculated objectively, and give relaxing exercises with the myoculator or prism base-in exercises with fixation at 16″.

When the objective findings show but little astigmatism there is a temptation to take for granted that a spherical correction is all that is needed.

Undoubtedly some of our best corrections are those of small cylinders with oblique axis or against the rule, especially if there is a small spherical correction, combined.

The lines on the fan dial chart may all appear equally blurred and the two lines on the wheel chart look alike. This should not be the last step in rechecking but the two lines of the wheel chart should be placed at 90° and 180° place a — 0.50 cyl. axis 90 and 180. If the vertical line appears blacker when axis is 90 and horizontal blacker when placed at 180, use a — 0.25 cyl, axis at both lines, next a — 0.12 if this also reverses the lines you may be assured there is no manifest error of astigmatism to be corrected. If you do find a 0.25 or 0.37

is needed, the correct axis may be found by again using the fan dial chart.

The patient may now be able to tell a difference in the lines and with care on the part of the optometrist and patient all lines may be eliminated except 3 or 4 as the clearest, the axis being the center one of the three or between the center two of the four. The clear lines will maintain a clearness to the center of the semi-circle and is a good guide in selecting only the most distinct lines.

Many other rechecks may be used to confirm results if desired. In using the visual acuity chart, rotate axis of cylinder one way until the letters begin to blur, then rotate it the other way, the intermediate distance is usually a good approximation of the correct axis.

A recheck I like very much and use often is made by refogging, the final correction slightly, using the fan dial chart, rotate the cylinder until the lines look equally blurred. The axis found is most always dependable. This is also a very good check in locating the axis of a larger cylinder when axis seems to fluctuate with other methods.

Most cases will not present these conditions and a regular routine may be followed with success.

Seventy-five per cent of a well conducted subjective refraction does not depend on charts or methods of using them, but on the way you conduct the examination in regard to asking questions and in obtaining the correct response from the patient. You should never disagree, become impatient or be in a hurry. One case refracted well is worth six rushed through.

Probably the greatest temptation is to ask suggestive questions due to our objective findings. Since there is a tendency for patients to answer as they think you want them to, any suggestion lessens the chance to correct the actual manifest error.

Questions should be asked definitely and clearly with as few words as possible, giving the patient their own choice and plenty of time to decide which is better or worse—which is blacker of two lines and when they are equally clear.

Many times in using minus lenses the patient will prefer minus or less plus, but care must be taken in giving only the lens that actually improves vision and not just appears blacker.

I will describe a routine of subjective refraction for a compound hyperopic astigmatic correction, step by step.

The ophthalmometer findings show readings as follows:

R — 180th Mer. = 42.75 D. L — 180th Mer. 42.75 D.
90″ Mer. = 43.75 D. 90″ Mer. 42.75 D.

Skiametry.

Static, working distance, 26 inches.
O. D. total + 2.50 D. Sph. ⊃ + 0.50 D. Cyl. axis 80
O. S. total + 3.00 D. Sph.

Dynamic, fixation at 16 inches.

O. D. total + 2.50 D. Sph. ⊂ + 0.75 D. Cyl. axis 90
O. S. total + 3.00 D. Sph. ⊂ + 0.25 D. Cyl. axis 10

Patient sitting erect, head straight, frame adjusted carefully. I use a trial frame because of using plus cylinders. Left eye occluded. Vision fogged completely and slowly unfogging to 20/40. When the astigmatism is less than 1. D, 20/40 is sufficient fogging to use the astigmatic chart.

When fogging the eyes inform the patient that the vision will be blurred and that each succeeding lens will make it clearer.

As soon as they are able to read the 20/40 line of letters turn their attention to the astigmatic fan dial chart, inform them that they will see several blurred lines radiating like a fan and that some will perhaps look clearer than others.

The important thing now, is to have the patient eliminate all lines except the clearest ones and the fewer lines they finally select, the nearer we are to the final axis of the cylinder.

With a tapering pointer place about ½ inch from the lines near those suspected by the objective findings, endeavor to find out which lines are actually the clearest. They should maintain their blackness the full length of the line and often when several are clear, it is easy to select the best as usually only one or two will be clear the full length. Sometimes lines change and you will have to depend on further check tests. With the case under description, the lines 90° and 80° appeared exactly alike, making axis 85°. The lines on the wheel chart are therefore placed at 85° and 175° and the vertical line is found to appear blacker.

A — 1.00 D. Cyl. is placed at axis 175° (I always use a cylinder a little stronger than I suspect, allowing for any relaxation). In case the focal interval is not in front of the retina, the cylinder will make the black line appear blacker and this is a good check on keeping the eyes sufficiently fogged.

In this case the horizontal line appeared black which means the — 1.00 D. Cyl. is too strong.

A — 0.75 seemed to equalize the lines, at this time I placed a + 0.75 D. Cyl. axis 85° in the frame cell, this refogging the eyes again. Reduce the sphere slowly until patient is able to read the 20/30 line of letters.

The next step is the most important one in rechecking.

Place a + 0.25 D. Cyl. axis 85° over the plus cylinder in frame cell, this combination INCREASES the cylinder and the horizontal line appears blacker. Therefore, we know it is an over correction. The + D. cylinder is then placed at axis 175°, this DECREASES cylinder and INCREASES sphere which makes the vertical line appear blacker and we know this combination is an under correction.

We know now the correction in frame cell is within ¼ D. of being

correct. A +0.12 cylinder is then placed at axis 85° which increases the cylinder and the horizontal line appear blacker.

The + 0.12 D. Cyl. is then placed at axis 175° which makes both lines appear equal. Either the patient has failed to detect the difference in the lines or the + 0.75 D. Cyl. is an over correction.

A + 0.62 D. Sph. is placed in the cell and a + 0.12 D. Cyl. axis 85° and 175° also reverses the lines and we know the proper amount of cylinder correction is + 0.62 D. Cyl.

The important part of this rechecking is to AUTOMATICALLY know the effect of cylinders on the two lines. When using plus cylinders an *over* correction will cause the lines at *right angles* to axis of cylinder to appear blacker. An *under* correction will make the lines *parallel* to the axis of the cylinder appear blacker.

If the astigmatism is corrected, the patient will be able to detect a difference of an addition or reduction of ⅛ of a diopter with little difficulty. Simply instruct the patient to notice if there is a trifle difference, and they are usually proud of the fact they can tell a slight change.

Patient at this stage in the examination reads 20/30 +, a reduction of a quarter of a diopter gives 20/20 vision. Another reduction usually gives 20/15 vision.

The next step is to recheck on the axis of the cylinder. This is done by taking out the cylinder and putting in a PLUS SPHERE the same amount; this leaves one FOCI ON THE RETINA and making the meridian at right angles to this myopic.

Since one foci is on the retina we know we can secure a definite axis by the use of the fan dial chart, which again shows the 80° and 90° lines equally clear, making the final axis of plus cylinder at 85°.

This leaves the correction in frame cell as O. D. + 1.25 D. Sph. ⊃ + 0.62 D. Cyl. axis 85° V. A. 20/15.

The right eye is then occluded, and the left eye unfogged to 20/40 and patient instructed to again view the fan dial. The patient, for instance, sees line at 10° clearest and the 2 lines of wheel chart are placed at 10° and 100°.

A —0.75 D. Cyl. placed at axis 100° makes the vertical line blacker which means an over correction. With a — 0.50 D. Cyl. they appear equal and a + 0.50 D. Cyl. is placed at 10° in frame cell, this refogs the patient again. The sphere is reduced slowly to give 20/30 vision.

A recheck is made placing a + 0.25 D. Cyl. at axis 10° (increasing the cylinder) and we find that this change makes the vertical line blacker, and a + 0.25 D. Cyl. placed at axis 100° makes the horizontal line blacker. A + 0.12 D. Cyl. is placed at axis 10°, making the vertical blacker and a + 0.12 D. Cyl. at axis 100° (reducing the cyl-

inder) which makes the horizontal blacker. This leaves + 0.50 D. Cyl. axis 10° as the proper amount of cylinder.

The sphere is reduced to give the best vision, care being taken not to reduce any more than necessary to just give clear, distinct vision. A sphere is next placed in cell, the same strength as the cylinder and a recheck is made with the fan dial which again shows the axis as 10° and we can accept it as final. The sphere is now reduced to give the best vision, care being taken not to reduce it any more than necessary to just give clear, distinct vision.

The disk is taken off the right eye and the vision of both eyes equalized if possible. In checking up to assure ourselves that both eyes have the same visual acuity, place a + 0.25 D. Sph. before the right eye and compare with the left. If left is better, place a + 0.25 D. Sph. over left eye and compare with the right. The case under description shows that the left eye saw equally clear with + 0.25 D. Sph. added and it took another + 0.25 D. Sph. to make the vision of the right eye appear the better.

The binocular test is made next. Monocularly the eyes accept, after comparing them and giving them equality.

O. D. + 1.25 D. Sph. ⊃ + 0.62 D. Cyl. axis 85° V. A. = 20/15
O. S. + 1.25 D. Sph. ⊃ + 0.50 D. Cyl. axis 10° V. A. = 20/15

The cylinders are left in the trial frame at their exact axis and both eyes refogged to 20/200. If spheres are unequal in cell, add equal amount to each eye so each will be fogged alike. Both fogging spheres are slowly reduced at the same time, to a point which gives clear and distinct vision. Many times I have found that patients will accept from + 0.50 D. Sph. to + 0.75 D. Sph. more by means of this technique.

The final correction for distance reads:

O. D. + 1.75 D. Sph. ⊃ + 0.62 D. Cyl. axis 85°
O. S. + 1.75 D. Sph. ⊃ + 0.50 D. Cyl. axis 10° V. A. = O. U. 20/15

According to the objective findings the above correction may be given as the final prescription unless the muscular tests and further courses of diagnosis reveal conditions that require auxiliary work.

If the patient is a presbyope and you wish to prescribe subjectively, have the patient hold a reading card at the usual working distance, at the same time care must be taken in finding the natural position in use and if they do some particular work that demands an occupational near point other than 13 to 16 inches.

After the near point distance is fixed, have the patient read with ease, the smallest paragraph he can on the card. You may be guided by this in adding spheres. If you have a very accurate distance correction you may be very sure of a good near acuity.

If the lens is placed in cell that gives the best near vision, instruct patient to move the card backward and forward, thus assuring them a good near point range. A presbyope should not be fitted under normal conditions to be able to read the small print any closer

than 9 or 10 inches. In this way you have one-third of the accommodation in reserve for reading at 13 inches.

If there is latent hyperopia, a stronger plus will be required than is suspected by the age.

I have attempted to give a detailed description of a careful subjective refraction. We do know the importance of a careful objective examination and the other courses of ocular analysis and diagnosis but we also know that every case that has a refractive error and expects to be fitted with glasses, desires the very best correction possible, thus making our subjective refraction as important to us as optometrists as is our objective, and I feel it is only by the use of both that the best work can be done.

In mixed astigmatism when vision is very poor to begin with, it is wise to place the dynamic skiascopic findings in the frame cell always using a plus cylinder. The recheck may be made with the plus cylinders and later the axis check by using plus spheres instead of the cylinder.

In myopia, it is also wise to use the skiascopic findings with plus cylinders. In fact, the entire refraction may be made from the dynamic skiascopic findings, as the important part is the rechecking after you have come somewhere near the right correction and as stated before, this is simply a description of a routine of the details to help us arrive at the most accurate correction.

In conclusion, I wish to repeat the main points:

1. There should be complete ease of both patient and refractionist.
2. The patient should sit erect, head straight and frame adjusted carefully.
3. Do not ask suggestive questions, allow the patient to decide for himself, do not disagree or become impatient.
4. Ask definite questions, clear and to the point, a poor question elicits a poor answer.
5. Fog the eyes completely and refog slowly according to astigmatism suspected. Refract monocularly.
6. Use fan dial chart and have the patient carefully select the lines seen most clearly.
7. Place the two lines of wheel chart at corresponding positions.
8. Equalize the lines with a minus cylinder at right angles to clearest line of wheel chart.
9. Change to plus cylinder same amount with axis parallel to the clearest line of wheel chart.
10. Reduce sphere to give 20/30 vision and recheck amount of cylinder by placing + 0.25 D. cyinder axis parallel to axis of cylinder in frame cell, this increases cylinder and will make the line at right angles to the axis blacker if it is an over correction. Place a + 0.25

D. cylinder at right angles to axis of the cylinder in the frame cell which decreases the cylinder and should make the line clearest which is parallel to its axis.

11. Use + 0.12 cylinder at axis parallel and then at right angles to cylinder in cell which should reverse the lines if the correction in frame cell is correct.

12. Reduce the sphere to obtain the best vision, and place a sphere of the same amount as the cylinder in the cell and recheck the axis by use of the fan dial chart. Then replace cylinder again at corrected axis.

13. Compare the eyes by occluding one and then the other. Next place a + 0.25 D. Sph. over the right eye and compare again; if the left eye is better, place the + 0.25 D. Sph. over the left eye and if the right eye is better, no more spheres will be accepted monocularly.

14. Refract binocularly, leaving cylinders in cell at the exact axis. Refog and reduce slowly to the point of best vision obtainable.

15. Do not reduce the plus unless vision is really more distinct and not just blacker.

16. In prescribing for the near point never give more than a correction which enables the patient to "just read" at point of 9 or 10 inches. Care must be taken in prescribing for the practical working distance.

If you desire to use the refractor which is usually equipped with minus cylinders, it is important in my judgment, to always keep sufficient sphere in the cell and always use plus cylinders to recheck the amount of necessary cylinder. If there is a minus cylinder in the cell it will naturally have the opposite effect than that of a plus cylinder in the trial frame cell.

A + 0.25 D. cylinder parallel to the axis will reduce cylinder and a + 0.25 D. cylinder axis at right angles will increase the cylinder. It is much easier not to become confused with plus cylinders used both in refracting and rechecking and it is one of the reasons I prefer them. However, my chief reason for using plus cylinders is so that I can be sure that the focal interval is kept in front of the retina, and by rechecking with plus cylinders, the eye has no chance to accommodate to the condition that might be produced with minus cylinders.

A chain is no stronger than its weakest link, if subjective refracting is a weak link, I hope this article may strengthen it to the same degree it has in my practice. I can sincerely say that care taken in this special part of the refraction has given me increased confidence through satisfied patients, and I hope an equal confidence may be reinstated by readers and users of the technique.

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ON THE CAUSE OF CATARACT

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I have become greatly interested in the debate between Drs. W. H. Glazer and John C. Neill of Philadelphia on the subject, "Is Faulty Metabolism the Cause of Cataract?" and respectfully submit my views on this hypothesis.

Dr. Glazer states: "Physiologists frankly admit they do not understand the processes of nutrition of the lens" and "Anatomists are pretty well agreed that the lens is unorganized, having neither vessels or nerves."

The following may be entirely devoid of truth, coming as it does without any reference to textbooks or authority; however, we do know that the capsule enclosing the lens is a membranous substance and that it does receive nourishment and undergoes a form of metabolism both anabolic and catabolic. Why then is it not feasible that the lens is nourished by **osmosis**, the definition of which is: "The diffusion of fluids through a membrane."

Let us look at some of the known causes of cataract:

(1) Sugar has been found in the urine of about one per cent of cataract cases and the cataractous lenses of patients, the subjects of diabetes mellitus at times contain sugar (De Schweinetz).

(2) Cataract is allied with idiopathic diseases, with gout, malaria, influenza, rachitis, syphilis, angio-sclerosis, etc.

(3) Cataract has been produced artificially by poisoning rabbits with naphtholin.

Now all the above diseases set up automatically a process of metabolism and in order to cause cataract there must of course be an absorption of toxic agents. Is it not reasonable to assume that this is absorbed from the lens capsule into the lens through osmosis?

This would seem then to support the theory of Dr. Neill, in that faulty metabolism is a factor in the formation of cataract.

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GLARE IN VISUAL EVOLUTION

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Introduction

No matter what problem we are discussing along the progress of optometric practice, each one can be traced back to some past date, indicating that the theories thereby involved are more or less old. Our methods may be simpler, our instruments may be more emphatic in appearance, and thus the psychologic effect is increased, but the background is all based on theories which may have progressed, but originally laid down some centuries ago. For this reason, the writer does not claim any credit for any theories herewith given, but wishes to recall many of the known facts to the practitioners and compare these factors to the present needs of the public.

Reviewing the history of ocular refraction and that of the development of optical science we could trace back to the year of 350 B. C. Approximately around that time, Aristotle, the great Greek philosopher and disciple of Plato, described a form of light propagation showing the beginning of the advancement of physics and the department devoted to light. He also suggested nearsightedness as well as failing of vision at close work, for an advanced age. In other words he suspected what we call today, myopia and presbyopia. About 50 A. D., Cleomedes observed the magic bending of objects when placed in water. About 80 A. D., Plutarch described myopia as a condition without remedy.

Along the subject of "Glare" quite some work has been done, but has not been condensed to a point where the refractionist could pick it up, and get fair details in a short period of time. The writer will attempt to bring out these factors and theories in a condensed fashion.

Photophobia

The term photophobia has been defined as a supersensitivity toward illumination. The question is, what does this mean and what importance has it upon the present civilization? In general photophobia leads to discomfort to which the present generation seems

to oppose. If we were to observe the human mind we would find continued dissatisfaction as a result of the providing of newer improvements wherever comfort is in question. Partial comfort is no longer desired by the public. Photophobia is a condition which most refractionists remedy but there are quite a number of men who have different opinions. The points in the following pages will surely bring out the many reasons for the necessity of some form of remedy for photophobia:

In myopia, especially of higher amounts, photophobic complaints are not frequent and yet the writer found in his practice to relieve some minor complaints (which in the mind of the patient is really nothing), by cutting down the intensity of illumination. In higher cases of myopia there is in many instances an association of retinal or choroidal disturbance and fewer in number. There might be cases where the visual fibers do not transmit properly the nerve impulse to the subcortical centers of the brain, *i.e.,* the corpora quadrogemina and optic thalmi. The latter being a rare case we need not go into any detail. But cases of choroidal degeneration or retinal disturbances are rather frequent. In each of these cases a decrease of the illumination upon the retina is of advantage, and can be easily accomplished.

In hypermetropia, the supersensitivity is not due to any pathologic causes but because of the normal condition which in itself in many individuals warrants us in taking away the intense illumination. This is due to the fact that the rhodopsin in the layer of the rods and cones is not manufactured with the same rapidity as it might be. That is, to say, that we could reduce the amount of this chemical product and yet obtain the same visual acuity. In other words, with less effort the same vision may be obtained.

Glare

Glare is an excessive stimulus upon the nerve fibers for the conveyance of image perception to the cuneus. This occurs as a result of excessive illumination. This is not only obtained by gazing directly into sunlight, but also by observing normal objects. The polished surfaces upon which we are continually looking, such as furniture, walls, windows, elaborate clothing, reflect light into our eyes much more than the old type of furnishings which absorbed much of the light. Let us take just the ordinary book and compare it with the one printed some centuries ago, *i.e.,* the first editions. In the older days, the books were of rather rough material and the printing thereon was soft. Today, the paper is glossy upon which highly polished and varied colored types appear. The result of this is the fact that greater amount of light is reflected into our eyes at the present day. Of course, without light, we could not see, but there is a limit to everything and too much of light is just as unpleasant as insufficiency.

Some individuals with strong reserve powers will naturally com-

bat any discomfort resulted from excessive light, but there are quite a number of people upon whose outer contour the immediate resistance to this light can be observed. The most common phenomenon we observe is the so-called "squinting" which means that the individual is producing a slit opening of the palpebra for the result of cutting down illumination. This means that the seventh cranial nerve has to be put at work so as to make it possible for the orbicularis palpebrarum to contract. This is another unnatural condition. If we have excessive illumination, or glare, falling into our eyes, the stimulus to the short ciliary nerve fibers is also increased and the pupillary aperture is contracted in the attempt to cut down the illumination.

Absorption

Absorption is the transforming of light rays into heat by means of some optical medium. Light passing through water would not pass through in its entirety, but some of it would be transformed to heat. This phenomenon is called absorption. The ordinary lens that we use in our practice of eyework, does not transmit all the light that is incident upon its first surface, but some of it is absorbed and thus not transmitted. This absorption, however, is very small in percentage of the amount that in many cases should be absorbed. Tinted lenses, if not too deep in color, would absorb the proper amount of light so as to prevent any glare.

Adaptation

If we were to observe the different animals as well as their mode of life we would find that their anatomy conforms to quite some extent with their surroundings. Just to illustrate this, I may repeat here several points which seem so evident and yet have a definite significance. Fish have fins for the purpose of locomotion; their bodies are so constructed as to make their movements much easier; their respiratory system is such that will make it possible for the animal to extract oxygen from the water, which is needed in respiration. The horse, a mammalian animal is adapted for walking and running on ground, thus has strong, muscular feet. The bird, with its light body manages to fly with its wings, and keeps its body warm with the light, but warm feathers. Another of the chordate family is the tortoise with organs to live in water as well as occasionally on ground. The worm is an animal with a long and flexible body to enable it to make its way through the ground. And so down the line we could observe every animal and conclude that it is adapted so as to perform its function. In the human body with our erect bodies, the atmospheric pressure upon our skull would require an extremely strong skull in order to prevent the crushing of the cerebrum. For this reason, Nature applied the laws of physics, and constructed our skull of a hemispheric shape and of a form of connective tissue (osseous tissue) that will maintain the maximum amount of

pressure with the minimum amount of weight, so that our bodies will not crush under the weight of the head.

This same principle exemplified in the preceding paragraph applies to the same extent to the needs of the eye. If we were to make a study of comparative ocular anatomy, we could conclude that there is a definite progress in the advancement of animal eyes. The worm being the lowest animal having a visual organ, and the human individual being the highest form of animal could be well compared in a discussion of development, but unfortunately space does not permit such elaborate discussions. However, even the human eye has not come up to that point to which the needs of civilization has progressed. The last two centuries, there has been a continual development in industry, and of course, in the scientific world with the necessity of accommodating our own selves to the same extent. Nature, however, was unable to meet with this requirement to the full extent and left some loop-holes with the necessity of having artificial material to take care of the different new burden placed upon our human mechanism.

In the progress of civilization there have been improvements made which require to a very great extent, a change in the composition or construction of the eye. This has not been taken care of by nature, and very little modification has been going on, if any at all, in the anatomy of the eye. But because of the new requirements and burdens placed upon the eye, we must provide some means to supplement Nature. In the question of glare it seems almost evident that the eye has not been protected sufficiently. All the improvements along the progress of civilization show rather conclusively that the eye is asked to produce more rhodopsin than in the century past. In order to reduce this excessive burden, there should be some application in the form of slightly tinted lenses to absorb some of the excessive light and bring about the more natural and desired condition which will prevail itself by the indication of comfort.

If the question of dispute may arise in the form of wondering whether the old condition is less desirable, or this bright illumination was the needed one, we can explain the matter very easily. From data of the past, there seems no indication of asthenopia, while at present the complaint of photophobia is far more prevalent, and this condition is not fully satisfactory by correcting the ametropia that may be present. Squinting is the most common factor that patients will seem to resist in many of the cases. Blurring of vision in many occasions is brought about by the mere fact that the anabolic factors do not come about quite as rapidly as the catabolic products are produced.

This subject of the ultra-violet is rather extensive, and the writer will only bring out some of the important factors that would be necessary in explaining the question of glare and the remedy thereof. This, not visible color of the spectrum is a very important element in the growth of tissues as well as in the question of the metabolism.

Many of the arguments lead up to the point that it is our desire to cut out ultra-violet rays from the white light which enters our eyes. This, in my estimation, and in the opinion of many others, is contrary to the experimental facts. There can never, under the present situations, be too much ultra-violet entering the eye. Glare does not mean this condition, but what it does mean is the comparatively, or relatively slow building up of the visual purple compound.

There have been numerous experiments performed as to the need of ultra-violet which is present in the sunlight as well as in the present artificial light. Using frogs, it has been found that by the elimination or the decrease of ultra-violet by means of shading of certain kind, that the health of the ocular tissues become invaded. Degenerative changes have proven to us very conclusively that such shading which decreases or eliminates the ultra-violet is distinctly detrimental to the development as well as to the health of the eyes. Wherever the animal was permitted to live under the same conditions, except where the shading was eliminated, we have found that no material change in the ocular tissues had taken place.

From the just described experiment we can see the significance which this invisible ultra-violet ray means to the physiology of the eye. For this reason, we have to combine two factors in the attempt of cutting down the amount of light rays to the retina. The first thing to be taken into consideration will be the need of some tint in the lens to cut down the intense illumination while the other but just as important factor is such a lens that will not reduce the passage of the ultra-violet rays, but permit to pass through the lens, all rays of the spectrum without exception.

There should be some more experimentation done along the line of ultra-violet radiation so that one could make statements having more reference along the line. Of course, even with the proof we have now, we are able to make statements which can be backed up considerably. Therefore, it is to be remembered that ultra-violet is necessary in the natural and normal development of any body tissue, including that of the eye.

Psychologic Factors

In discussing any questions on "glare" one cannot consider a report to be complete unless some of the psychologic elements are, if not discussed, at least mentioned. It is optional whether the reader supports the theory laid down by Herring, Young and Helmholtz, or that of Ladd Franklin, for that problem has not as much to do with the remedy of "glare" in the form of tinted lenses as some may think. Of course, in the manufacture, a certain colored lens may be preferred and thus it will be necessary to compound that color in a desired shading to make it possible to meet with the necessary requirements.

There are certain psychologic factors, however, which should be mentioned at least, if details are omitted. In this paragraph, the

writer has reference to the subject of native and acquired traits. By this is meant a certain characteristic feature which differentiates that mental capacity which has to be first cultivated by experience with that which is within a person without any educative process. As an example, we may bring out the point of our impulse of eating, laughing, crying, stretching or grasping for objects. These factors just mentioned are traits which a child is not trained for. On the other hand, there are many things, in fact, most of the problems, which an individual cannot do nor even dream about without having acquired it through some means. If the trait is of the type which has been acquired, it can, of course, be altered if circumstances make it necessary. On the other hand, a native trait, *i.e.*, one which is practically part of the individual, can only be changed through force, if at all. When we apply this theory to the eye and light, we will readily understand why the writer found it profitable to devote some space to this branch of science.

In the eye we can see the problem solved without any exertion or burden laid upon our mental capacities. A stimulus is generally defined as a change. This change must be of a sudden nature and as an example we may mention the touching of a pin, a sensitive object such as our hand. A response is the result that has occurred after the stimulus has acted. A bright light would be a stimulus to the eye, and the response would be an attempt to combat it in some form, either through squinting, or shading the eye with the palm of our hand. Pausing here a moment in the attempt to place this phenomenon in the proper class, *i.e.*, either as a native or as an acquired trait, it would take a very short time to decide that necessarily it is a native trait. We automatically attempt to prevent ourselves from his bright light by natural means. This being the case, there can be no further dispute that glare is detrimental to the health of the eyes.

As additional evidence of the necessity for absorbing some of the excessive light rays in case of glare, which is present invariably, the chapters on sensation and perception from the psychological science should be mentioned. Sensation is far from being the same as perception and yet they are linked closely together in their relationship. This is true because one follows the other immediately. Woodworth** defines sensation as a response aroused in us by the stimulus. It is the activity of the sense organ and sensory nerve. Stimulus is the immediate reaction to the stimulus. According to the same author just mentioned,**** perception is the culmination of the process of discovery. It is, therefore, a response which follows or leads out from the sensation. The hearing of a typical noise on a street while we are sitting inside of a room would be the sensation, but our mind working rapidly, concludes without looking out from the window that there are a number of boys playing, this would be

**Psychology. A Study of Mental Life, page 186.
****Psychology. A Study of Mental Life, page 421.

perception. If a light source sends out rays into the eye, they would produce the sensation but the making up of the image against the background would be the perception. Supposing there is a very intense light source which suddenly is turned toward an eye, we could not have proper image perception. This is not referred to as a case of an automobile where the headlights are not properly focused, but to the average object we continually look at. If an object is illuminated excessively the image perception is poor. Or, in other words, we do not see quite as well as we should. This is only another illustration how important it is to act against glare.

Pathologic Proofs

In the previous pages it was shown what a significance glare played in reference to the eye which enjoyed perfect health, not mentioning any examples of proof for the need of absorption lenses. It is, of course, understood at this time that these lenses must maintain all the ultra-violet rays. Deviating at this time, we may just look into that phase of pathology of the eye which is evident even to the average layman. There are numerous symptoms which do not differentiate the disease from any other, but indicate that pathology is present. These cases are, of course, handled by men specializing in that branch of eyework, and all (or most) have the symptoms of photophobia, lacrimation, blepherospasm, diminution of vision. At this time we are mainly interested in the fact that photophobia sets in as soon as some deviation from the normal occurs. This modifies all statements which claimed photophobia to be absent in all people. The truth is, that in very strong individuals, it may be arrested, but just as soon as some ocular disease presents itself, photophobia never fails to show itself.

We may illustrate this condition with another form of example. If a machinery has a minor defect, it will nevertheless manage to carry on the work. But should, during its course of natural use and abuse, another part of the same piece of machinery begin to give way, we would find that the entire machinery either gives up the battle, or lets us know that something is wrong by means of noises. The same thing can be applied to the question of photophobia. If an eye is corrected, not only to care for the refractive conditions (nonpathologic) but also to avoid glare to the eye, then there would be less opportunity for the eyes to develop into such a form of fatigue, which is classed under the heading of pathology. Frequent cases of conjunctivitis are due to the fact that there is additional nutrition (blood supply) needed in the eye and Nature, in its attempt to combat it, sends this nutrition through the palpebral vessels, and many a time overdoes it with the result that there is an abundance of blood in the palpebral conjunctivita.

The greater part of the previous paragraph is not a pathologic

question, but the writer has put it under this heading because he was anxious to compare the fact that photophobia is synonymous to a smaller, unnoticed defect in a machine, which then would show itself immediately after some other small complication sets in.

Physiologic Process

Nature, by its own wonderful initiative has made up structures to perform a definite function. In a few words we might summarize some of those functions which have to do with our discussion of photophobia. The retina acting as the receptor of the picture of objects in space, has to be made up of very complicated structures to perform its functions. The functions of the retina, as we know, are to receive light energy, to transform light energy into nervous energy and to transfer the nervous energy to the true centers of vision, the cuneus, through the archuate fibers from the subcortical centers of the brain. If the light is too intense, the objects cannot be seen distinctly, because not all the sensation was perceptible. Hence we only had light perception. This occurs because the archuate fibers carry an impulse only if image perception is a result.

This particular function of the retina which has to do with the transformation of the light energy to nervous energy is directly in relation with our subject. This occurs in a most peculiar fashion. Light entering the eye, and passing through the media of refraction (cornea, aqueous, lens vitreous) reaches the retina. Through a magnetic force, one of the interior layers of the retina, the layer of rods and cones are attracted by the light and are pulled slightly forward. This action informs a complex chemical compound, the visual purple (retinal red or rhodopsin) to change this light energy into nervous energy. There is a regular amount produced which meets the demands of everyday life. On the other hand, if an excessive amount of light waves produce the molecular agitation, the retina is not able to transfer the stimulus to the brain as efficiently as it normally would and in numerous instances retinal fatigue may result. This form of retinal fatigue differs from the one produced by complementary colors.

Defects of Lenses

Before putting down the pen and concluding a paper on this subject of "Glare," not only is it necessary to put forth the remedy thereof but also point out some of the disadvantages and advantages, looking from an angle of theoretic optics, instead. Among the many defects present in every lens, there might be one classed here, *i.e.*, images do not have a definite outline of margins of images under bright illumination. With experimentation it has been found that in twilight, images seem to stand out more than if the strong sun is sending its illumination down directly upon the object. If such is the case, we can reduce the intense illumination with slightly tinted lenses which will then afford our patient not only greater comfort for the

physiological reasons, but also because of the application of the laws of physical optics.

Prevention vs. Treatment

Any anomaly can be remedied in two ways, either by acting so that there will be no opportunity for an anomaly to set in, or else by correcting it after it has become evident. Among these two remedies, the preventative method is far superior to the second one. I was told that in some of the Eastern countries, such as China, the physician receives a fee to keep the people healthy, while he received no fee during the time the individual is confined to his bed. This point I had the opportunity of elaborating during a lecture given last year before a certain organization. Going on further, the writer can quote from his own experience while traveling through Europe some years ago. In one of the countries an attempt was made to try a system of means by which the doctors were paid all year round, regardless whether his services were required or not, but when his services were needed, he was to be there. Under these circumstances, no one hesitated to call a doctor with the end—result of the presence of less diseases.

This principle of prophylaxin is the same as using slightly tinted lenses where the condition may not yet be a painful one. Sometimes it may be too late to remedy the condition when not only the pain may be too intense, but entirely beyond a point of possible relief. The condition of glare is increasing rapidly with the everyday improvements made along scientific endeavors, and so we must be fully prepared to meet this condition. Dodging from it will do no good, for a patient never will fail to complain if the slightest thing may be annoying. In addition to this it would be well to prevent the possibility of even having photophobia. Under this problem, we would include everyone working under intense illumination even though the patient as yet may not be aware of what is going on in the preparation of revolt in the retina. Prophylactic procedures are always recommended.

Conclusion

All the data herewith discussed had been compounded from the proven scientific facts familiar to us all with the writer's views. As a whole, one may say that the question of glare has been examined from all the scientific points, and thusly a proof thereof given. The defects themselves as well as the remedy is not new, but the collaboration of the data was necessary to point out that such a remedy is very vital for the comfort of our patients. Of course, whenever we have a rule, we must have exception, therefore, it is expected that a writer could not say, "This will hold the acid test all over the universe." We cannot be so narrow-minded as to think that a theory will work out in every case, but that is why we are all given that mental training which will permit not only a basic background, but also enable us to reason much better.

The lesson, this thesis was to bring home, is to awaken the background which proves that glare is not the best thing for the eyes. We have to modernize in order to do justice to the patients. This condition has been brought about by catabolism, superseding the anabolism of the visual purple compound in the retina. The remedy is such a lens which will not absorb too much of the light, which will present such a test under which the ultra-violet rays have not been cut out any more than a white lens, and finally meet the plea of the patient. That is, the color of the lens will be such that it will harmonize with the facial color so that there will be no resentment as to the ambiguous appearance. In other words, the practitioner must remember to be practical and not only theoretical.

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A FEW NOTES ON THE LAG OF ACCOMMODATION THEORY OF McFADDEN

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The articles on Dynamic Skiametry and Skiametry published during the last two years by Dr. Fay McFadden should not go unnoticed. Of the number of works published on refraction, nowhere will one find these theories as analytically described as have recently been done by him. In this he again has proven himself one of the few great thinkers and students in optometry.

Dynamic skiametry needs, in my belief, a new interpretation, a new working hypothesis for some of its variations. Drs. Cross and Sheard have given their best to this subject. Dr. McFadden proves that we have reason to doubt some of their theories. I agree, after reading his articles, and so do others. The difference between static and dynamic findings on a pair of eyes, physiologically normal in all their functions, was explained as a "lag of accommodation" behind convergence. This was accepted as being equal to + 0.50 D. or + 0.75 D. in all normal cases. This "accommodative lag" *may* occur in some cases but Dr. McFadden doubts the theory that the reason for this difference of + 0.50 D. to + 0.75 D. is an "accommodative lag" in most cases.

Most scientific theories are accepted when they provide a working principle by which we can explain cause and effect. The theory of the "accommodative lag" does seem to serve its purpose to some extent in explaining why we find the above mentioned differences. However, a closer analysis of the whole subject develops a logical reason why we can discredit the theory of the "lag." Does it seem *reasonable* and *easy* to believe that an eye can read the finest print clearly at a near plane and yet *not* completely adjust its optical system for retinal conjugation to this plane? Sheard says that, during a dynamic test, the fact that the patient *endeavors* to read the fixation target is all that is necessary—that it does not mean that he *must* be able to see it. I can understand this statement if it relates only to presbyopes or amblyopes but not as it relates to normal eyes with full accommodative power. The answer to my question is that it is difficult to believe that the "lag theory" explains the differences between static and dynamic findings in normal eyes.

Several logical theories are set forth by McFadden for the above differences, some of which I will repeat as follows: First—Faulty fixation of the patient due to (a) Poor fixation targets. (b) Brightness of retinoscopic light which insensitizes eye being refracted. Second—Aberrations of the optical system of the patient's eye. Third —Coma of the reflex. Fourth—Location of the origin of the "crest" of the reflex on the surface of the choroid, rather than on the surface of the retina, creating a different dioptric effect skiascopically to that of the eye, amounting to about + 0.50 D. All of the above theories are, it seems to me, more logical than the "lag" theory. Perhaps all or one of them are involved in the real cause for the dynamic differences in the various cases.

Professor James P. C. Southall of Columbia University, has written an article published in the Journal of the Optical Society of America, September, 1926, entitled "The Optical Theory of Skiascopy." I shall take the privilege of quoting a few paragraphs from this concerning his conception of skiascopic variations and which in part agree with Dr. McFadden's theories.

"To take a specific instance, let us suppose that the examination is being purposely conducted at a distance not much greater than the average normal distance of distinct vision for near work, say 13 inches (or about one-third of a meter); and that the patient is required to fixate a target at this distance and to distinguish clearly certain minute details on it. Under such conditions it is practically invariably the case that the skiascope will indicate a decided movement 'with the mirror,' and in order to find the point of reversal, the distance between the two eyes has to be slightly increased without altering any of the other conditions. Various hypotheses, more or less ingenious, have been offered to account for the neutral region and to explain the apparent discrepancy between theory and practice which has always been something of a stumbling block in the way of dynamic skiametry. Thus, for example, it has been suggested with much show of reason that the difficulty that is encountered here in this particular instance is due to a certain lag of accommodation behind the convergence of the two eyes, so that the measurement would really amount to a determination of one portion of the amplitude of relative accommodation for a given degree of convergence. The trouble with this explanation is that exactly the same result is obtained with the skiascope when the illumination is dim and the patient fixates with the illuminated eye, while his other eye is completely screened.

"The writer is persuaded that the true explanation of the whole matter is to be sought in the monochromatic aberrations of the human eye, and that, admirable and useful as the ordinary method of skiascopy is for the determination of refraction, it should always be checked and supplemented by subjective methods of measurement. Gullstrand's mathematical and stigmatoscopic investigations of the complicated form of the caustic surfaces in the case of a bundle of rays that have traversed the dioptric system of the eye (as described

for example, in Chapter V of the Appendix of Volume 1 of the English translation of Helmholtz's Physiological Optics) show that with a pupil of moderate size the place or section of most advantageous convergence of the bundle of rays for distinct vision is quite appreciably different from the cusp of the caustic surface where the so-called paraxial rays are focused. In fact, his measurements indicate a difference of focus on account of aberration which in the case of an emmetropic eye with pupil of moderate size may amount to as much as 1.5 dioptrics of hypermetropia along the axis. Consequently, in his very careful calculation of the schematic eye, Gullstrand has compensated for the effect of aberration by allowing a certain average value of one diopter; in other words, the refraction of the unaccommodated schematic eye must be equal to one diopter of hypermetropia in order that it shall be equivalent to an actual emmetropic eye under the same conditions. Now in the optical theory of skiascopy as developed above no account whatever was taken of the effect of aberration. The so-called focus plane was defined simply as the plane conjugate to the surface of the retina; which would be identical with the transversal plane conjugate to the cusp of the meridian section of the caustic surface, if the cusp itself were situated on the retina. But since this cusp is not after all the most advantageous place of convergence of the rays for distinct vision, the focus plane will not coincide with the plane on which the eye is fixated, that is, the plane of the target on which the patient is able to see the details distinctly. When the mirror is adjusted in the latter plane, it is natural to expect, therefore, that there will be a movement of the reflex exactly as is found to be the case. When the eye is accommodated for comparatively near vision, the change of focusing required to shift the retina, figuratively speaking, from one section of the bundle of refracted rays to another closely adjacent section may easily amount to as much as a diopter or more. Consequently, the whole reason for the confusion that has been the subject of so much controversy especially in connection with dynamic skiametry and for the apparent discrepancy between theory and practice would seem to be due to the unjustifiable identification of the so-called focus plane with the plane of the actual target on which the eye is fixated."

It is suggested that more thought be given to the study of "aberrations of form" from a theoretic angle as this knowledge is absolutely necessary for clearer understanding of lenses, refraction and skiascopy.

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MASSAGE AS AN AID IN TREATING AMBLYOPIA EX ANOPSIA

Simple massage, vibratory massage and pressure massage have been used since 1870 by certain practitioners, in their treatment of squint cases, particularly with reference to those patients who were suffering from an amblyopia ex anopsia in the non-fixing eye.

The use of massage in these squint cases was, it seems, supplemental to the usual therapy employed to stimulate the visual centers and later to develop fusion and binocular vision. In other words, massage was added to most of the accepted therapies for treating amblyopia ex anopsia and squint, these being, occlusion, amblyoscopic training, stereoscopic development and bar reading, as outlined by the writer in this Journal in June of this year.[1]

In reviewing this matter of ocular massage it is well to first outline the various technics employed, as well as their possible value.

Lewis[2] in writing of simple massage claims that there is no organ of the body whose vascular and lymphatic circulation is more readily affected by well-regulated simple massage than is the eye. Besides increasing the circulation of the blood and lymph, it stimulates muscular action, reduces tension, and relieves pain. By it, absorption is also stimulated and intra-ocular tension temporarily reduced, but it is contraindicated in all conditions in which its use is followed by red-

ness of the eye, the increased flow of tears, and sensitiveness to light. Simple massage consists of gentle stroking movements made upon the closed eyelids with the fingers in centripetal, centrifugal, and circulatory directions. In massaging the upper lid and the upper part of the eyeball the patient is directed to look down, and in massaging the lower lid and the lower part of the eyeball he is directed to look up. In no instance should undue pressure be exerted upon the eyeball. Ocular massage may be administered from one to four times a week for from three to four minutes at a time.

Vibratory massage is applied by means of mechanical vibrators giving from 2,500 to 9,000 minute ocular vibrations per minute. Special cups are provided which fit snugly over the lids and which transfer the mechanical vibrations to the lids and on to the eyeball itself. Dr. A. Darier,[3] past president of the Ophthalmological Society of Paris, who has used this vibratory technic, recommends it in these squint cases of amblyopia ex anopsia, he believing that its trophic action on the tissues of the eye are beneficial. In other words he believes the vibratory massage action is beneficial in these cases upon the circulatory, secretory and excretory intra-ocular tissues.

Pressure massage is applied to the cornea of the eye through the lids. The thumb is used as a plug, the fingers being extended flatwise on each temple. The pressure should be vibratory in character, rather than continuous. Each treatment should, according to Domec,[4] last from three to five minutes, with rest intervals according to the tolerance of the patient. He suggests that at first the treatments be administered in such manner as to scarcely touch the patient's lids, gradually increasing the pressure as the patient adapts himself to the technic. Great care should be employed in this therapy, as too great a pressure on the lids may produce a rupture of the choroid or the retina or might even cause a dislocation of the crystalline lens. This therapy when vigorously applied is quite painful. According to Darier, previously quoted, pressure massage is beneficial in these cases of amblyopia ex anopsia because of the mechanical stretching of the zonule, induced by the vibratory pressure on the lids and cornea. Darier does not recommend this pressure therapy for patients over 50 years of age as its use may accelerate the development of opacities in the crystalline lenses of cases which are suffering from cataract in its incipient stages.

John Cowan[5] of Manchester, England, in a paper on this subject in the Dioptric Bulletin quotes the technic and results obtained by Domec, as follows: "He reported that by means of pressure massage he obtained a reduction of hypermetropia, together with an increase of visual acuity, especially in eyes with amblyopia ex anopsia, such as are met with in hypermetropic squint cases. In one case, he reported that the hypermetropia was reduced from 5 D. to 1.5 D. and the sight rose from one-twentieth to one-sixth, while the finest type could be read with relatively weak glasses. Domec's explanation is that the pressure on the cornea is transmitted through the

ocular media. The lens joins in the see-saw motion. This stretches the zonule of zinn and eventually lengthens it. The action of the ciliary being increased, the power of accommodation is rapidly augmented."

Cowan also quotes the technic and results of Darier, as follows: "He experimented with both the vibratory and pressure forms of massage, finding the results very similar. His opinion was that in many cases of strabismus where one eye was amblyopic, that massage combined with stereoscopic exercises, etc., it was possible to diminish the amblyopia or to cause it to disappear and then establish binocular vision by bar reading. Darier also stated that hypermetropic convergent squint in patients between ten and twenty years of age, the results were brilliant. His technic was as follows: "The patient's refraction was estimated both objectively and subjectively and vision noted with and without correction. The amblyopic eye is then subjected to massage for a period of from ten days to three weeks. One may then expect some improvement of vision. As soon as sight is improved, glasses are prescribed which correct the ametropia in the amblyopic eye. Atropin (or a suppression lens) is applied to the sound eye to repress it. Later binocular vision is encouraged."

The results of Domec and Darier indicate that the matter of including massage in our therapeutic series for squint cases should be investigated. Of course, both of these men used most, if not all, of the accepted optometric measures known to relieve the amblyopia and the squint in addition to massage, yet they report progress in some cases far more rapid than usual and furthermore they report progress in patients of such ages as to be practically considered hopeless with present optometric technic alone.

Massage, like any other therapeutic measure must be administered intelligently and with the greatest of care. Not every practitioner is now skillful enough to use this therapy without harm, yet the experiences of Domec and Darier warrant further research into the matter. Massage, if proven to assist these amblyopic squint cases, will prove a blessing whose technic can in time be readily mastered by all refractionists. C. C. K.

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BOOK NOTICES

DYNAMIC SKIAMETRY. Thomas G. Atkinson, M. D., and Frederic A. Woll, Ph. D. Published by the Professional Press, Inc., 17 North Wabash, Chicago, Ill. 192 pages. Illustrated. 1928. $3.50.

This new book by Atkinson and Woll on Dynamic Skiametry compares favorably with its two predecessors, "Dynamic Skiametry" by Cross, 1911-1915, and " Dynamic Skiametry" by Sheard, 1920, now both out of print, and the fact that the authors of this new work, include much of importance from the writings of these optometrists adds in no small measure to the value of the book.

The importance of the dynamic skiametric tests to optometry cannot be estimated and the new book, now being reviewed, therefore fills a very necessary niche, being the only text on the subject procurable. Its timely appearance will unquestionably fill a much needed want, on both sides of the Atlantic where its merits will be fully appreciated.

Atkinson and Woll review the theories of Cross and then the interpretations of Sheard, adding their own hypothesis on the principles of skiametric procedure. The entire techinque of dynamic skiametry is outlined along with the relation of the findings to those of other tests. The work is clearly written and every effort has been made to make this text a hand-book of usefulness for both the practitioner and the student.

Chapter 1 deals with the optical principles of skiametry. Here the authors go into some detail to clearly review the fundamental laws of physics which are applied in this technique. Professor Southall and Professor Treleaven are quoted at some length here, the views of Lionel Laurance on this subject also being given. Several pages are devoted here also to the principles involved in streak skiascopy. The authors make what seems to us to be a very splendid point in a footnote on page 7. It being short and to the point, we give it in full as follows:

"The terms 'retinoscope' and 'retinoscopy' are misnomers, inasmuch as with this instrument and by this method of refraction we do not view the retina, far less examine it, but base our findings on the observation of movements of the light reflex at the puppilary plane,

and the apparent movements of the shadows which follow the light movements. They have therefore been discarded from the terminology of modern oculo-refractive science, and replaced by the words 'skiascope' and 'skiametry.' Even these are note quite accurate, since it is not the shadows but the light reflex whose movements we observe. But they are considerably nearer accuracy than are the older terms. Throughout the book, therefore, the modern terms will be employed: SKIAMETRY for RETINOSCOPY; SKIASCOPE for RETINOSCOPE."

This is somewhat gratifying to us here at the Journal office, inasmuch as we have endeavored for the past several years to follow this same rule, in various editorials, when referring to this part of refractive technique.

Chapter 2 is really divided into two parts, the first dealing with the work of Cross, though also mentioning the various beliefs now held by others on the value of dynamic skiametric findings. The second part is taken up with a review of the extent of relationship between accommodation and convergence. The authors find the theory of Cross at fault for the following reasons: First, he assumes that convergence is wholly or at least uniformly, stimulated by accommodation, whereas in fact this is not the case. A considerable portion of it is stimulated by the fusion sense; and this portion is by no means a constant quantity. Second, Cross does not take into account the phenomenon of relative accommodation. Third, in those cases which revealed a larger plus finding with dynamic than with static, Cross was prone to attribute this to latent error which when corrected would in time be fully accepted. Experience has proven the fallacy of this on many occasions.

The authors then review the difference of opinions as held by many optometrists on the value of the findings resulting from the use of the dynamic test, dividing the holders of these opinions into three groups. The first of these being composed of men who still continue to hold the general view that the dynamic findings indicate the full distance correction, but not necessarily the correction which can or should be given the patient. It represents, in fact, say these men, the limit of ciliary relaxation in any individual case, in much the same way that a finding under a cycloplegic does. The second group is composed of men who regard dynamic skiametry as a valuable method of demonstrating and working out conditions of accommodative efficiency. These men make a distinction between accommodative insufficiency and accommodative inefficiency. The former is they claim, of course, presbyopia, either normal or premature; the latter means that the ciliary muscle is not properly innervated. According to this view, the excess plus finding of the dynamic over the static test represents the ciliary deficiency in that particular case for the distance at which the dynamic test is made. The third group believes that dynamic skiametry is a quick and sufficiently accurate method of determining the negative relative accommodation of the eyes. This latter view is that held by Sheard.

Chapter 3 is devoted to defining dynamic skiametry. This is the most involved chapter of the book and one might say the one in which it is most difficult to follow the authors. Cross, Sheard, Southall, Gullstrand, McFadden and Pascal are all quoted at some length, the authors at the same time giving their own reactions to the various somewhat divergent views of these men.

Chapter 4 is devoted to outlining the general technique to be followed in using the dynamic skiametric test. In the main, the authors agree that the test is to be made binocularly, first upon the naked unaided eye and later checked with the distance correction in place. Specific techniques for checking hyperopia, myopia, presbyopia, astigmatism and accommodation are given. Sheard's and Pascal's methods are also fully reviewed. In addition to these, what is to the reviewer at least a new technique in dynamic skiametry for determining the equality or inequality of accommodation in the two eyes, is given.

Chapters 5 and 6 are devoted to the test itself, the working distances, fixation objects and specific technique to be employed. These are chapters which are invaluable as they represent the most advanced thought on the subject.

The work of Atkinson and Woll closes with Chapter 7 in which the authors hook up the findings of the dynamic skiametry test with those of other tests showing the relationship between these various tests. In the opinion of the reviewer this last chapter could have been somewhat enlarged as the subject is but briefly dealt with, yet what is given will be of value to all optometrists if carefully studied. Eight case reports are herein cited illustrating various points brought out in the text.

As editor of the American Journal of Optometry, in reviewing this book I unhesitatingly say that its appearance is one of the outstanding events in optometry for the year 1928. The book itself deserves a wide distribution, the authors the applause of all refractionists and the publisher, Mr. L. Topaz, the congratulations of the profession for sending forth such a needed and valued text.

C. C. K.

HAAB'S ATLAS OF OPHTHALMOSCOPY. Dr. O. Haab, Professor of Ophthalmoscpy, University of Zurich. Translated and edited by W. B. Barker, F. B. O. A. (Hons.), Lecturer in Applied Optics, College of Technology, Manchester. Published by the British Optical Association, Cliffords Inn Hall, Fleet Street, London, E. C. 230 pages. Illustrated with 87 colored plates. 1928.

The British Optical Association is to be congratulated in the publishing of this great work on ophthalmoscopic diagnosis. Haab's Atlas has in the past, stood forth as one of the monumental works of its kind, and as this has been out of print for some years, the optometrists of England have performed a real service in arranging with the original German publisher to have the color plates made from the same stones which were used in the first German edition. In fact, the plates themselves, in the present edition, were printed in Germany and then sent to England to be bound with the rest of the book. Permission was granted to Barker to translate the original text into English which he has done very nicely. Members of the British Optical Association were able to secure this work at a very reduced figure and the society has again proved its worth to the optometrists of England.

The value of the book lies not in the first few chapters on the use of the ophthalmoscope, but rather in the colored plates which show the appearances of various pathologic fundi, and in the several paragraphs of descriptive matter which accompanies each plate. This material has been so nicely translated and arranged in such a convenient manner that it makes the careful perusal of this text a pleasure, not frequently enjoyed in books of this character.

C. C. K.

PROCEDURE IN OCULAR EXAMINATION. A. M. Skeffington, Opt. D., D. O. S., F. A. A. O. Published by the Author at 4300 Ellis Ave., Chicago, Ill. 118 pages. Illustrated. $3.50. 1928.

Skeffington is too well known in the optometric world to require an introduction. The outstanding work he has accomplished as National Clinician for the A. O. A., and later as head of the Graduate Clinic Movement, stamp him for all time as one of the great inspirational optometric leaders; a man whose undivided attention has been devoted during the last seven or eight years to improving the educational standing of the practicing optometrist. This new book by Skeffington is merely another link he is forging in his splendid Graduate Clinic Movement plan.

The book is a well written review of an orderly ocular examination. Each step of the procedure is dwelt upon at some length and while certain of the minor check tests are perhaps omitted, he has, in viewing this work as a whole, completely covered the subject in a clear, easily understood manner. Optometrists who have been fortunate in hearing him speak will recognize in his writings the same splendid ability to make matters easily understood, which characterizes his speaking.

Of the thirteen chapters in the book dealing with various phases of an ocular examination, the third on ophthalmoscopy and the tenth on cross cylinder procedure are by long odds the best and most outstanding. In fact, the chapter on ophthalmoscopy is in the reviewer's estimaion one of the exceptional papers of the year, ranking with Atkinson and Woll's, "Dynamic Skiametry" and with Ryer's classical paper published in this Journal in February of this year on the "Control of Myopia by Reverse Stereoscope."

In the third chapter Skeffington outlines the Modified Dean Ophthalmoscopic Technique in such a careful manner that any practitioner can, after a studying this chapter incorporate this ophthalmoscopic technique in his routine in place of the more commonly used direct method, a change which we believe should be made.

The book is well illustrated, eleven plates showing the patient and examiner in different phases of an ocular examination. The chapter headings are as follows: On Taking of Subjective History; Determination of Visual Acuity; The Ophthalmoscope; The Ophthalmometer; Primary Phorias; The Retinoscope; Subjective Refraction; Phorias and Ductions; Cross Cylinders; Color and Form Field Determination; Determining Cyclophoria and Strabismus, each being a well written expose of the subject.

C. C. K.

THE RETINAL CIRCULATION. Dr. P. Bailliart, Paris, France. Translated by Dr. J. E. Lebensohn. Published by the Professional Press, Chicago, Ill. 220 pages, 43 illustrations, 1928. $3.50.

Dr. Bailliart has made a special study of the retinal circulation under normal and abnormal conditions and this valuable book on Retinal Circulation is the result of his many years of research and clinical study. The author in the first four chapters gives a minute

description of the normal anatomy, embryology, and physiology of the retinal circulation as well as of the venus and retinal capillaries circulation. The next fifteen chapters are devoted to the description of the various abnormal conditions of their functions. Particular stress is laid on the retinal circulation in glaucoma, in diseases of the heart vessels and in cerebral diseases.

Many points of interest from the standpoint of differential diagnosis are to be found in the pages covering the discussion of the abnormalities of the retinal circulation.

The last chapter deals with the treatment of affections of the retinal circulation. While studying this book one will be astonished as to how much progress there has been made along the lines of diagnosing and localizing the different lesions and as to how little can be done in most of these cases from a remedial standpoint.

J. I. K.

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